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DRAWINGS ATTACHED

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(54) IMPROVEMENTS RELATING TO A CONNECTION CONNECTING ELECTRICAL CONDUCTORS

(71) We, ROBERT BOSCH G.m.b.H., a German Company, of Postfach 50, 7, Stuttgart 1, Germany do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a connection connecting an electrical aluminium conductor and a copper braid constituting an electrical copper conductor.

In the case of electric machines having aluminium windings it is essential that parts subject to wear, such as carbon brushes, can be interchanged manually in the simplest possible manner even in small workshops wherein it should be possible to connect electrical parts together in a secure manner by, for example, soft soldering.

However, if an aluminium conductor is soft-soldered directly to a copper conductor a local cell may be formed at the soldered joint. This local cell may produce an electrochemical reaction which destroys the joint.

A feature of the present invention is that a connection is provided which enables defective parts, or parts subject to wear, to be interchanged in electrical machines and appliances having aluminium and copper conductors, which reduces the risk of a local cell being formed at the soldered joints joining aluminium or copper conductors.

In accordance with the present invention there is provided a connection connecting an electrical aluminium conductor to a copper braid constituting an electrical copper conductor, said connection comprising a sheet metal part welded or clamped to said aluminium conductor and soft-soldered to said copper braid or clamped to said aluminium conductor and welded to said copper braid so that the formation of a local cell between said aluminium and copper conductors is prevented and wherein a region of said sheet metal part remote from the end thereof welded or clamped to said aluminium conductor is provided with an aperture.

The invention will be further described, by way of example with reference to the accompanying drawings, in which:—

Fig. 1 is a perspective view, partly in section of a connection of the present invention for connecting a carbon brush to an aluminium conductor;

Fig. 2 is a cross section through a connection employing a sheet metal part made of copper;

Fig. 3 shows a portion of Fig. 2, drawn to an enlarged scale, showing the welded joint between the sheet metal part and an aluminium conductor;

Fig. 4 shows a further connection having a sheet metal part secured to an aluminium conductor by a copper braid; and

Fig. 5 shows a still further connection having a sheet metal part clamped onto an aluminium conductor by means of tongues.

Referring to Fig. 1, a sheet metal part is generally designated 10 and serves for electrically connecting a carbon brush 11 of an electric machine (not illustrated) to an aluminium stator winding. The end of the stator winding to be connected to the carbon brush 11 is in the form of an aluminium strip 12. The sheet metal part 10 is bent, and one side 10*a* thereof is made from copper and the other side 10*b* is made from aluminium. The copper plate 10*a* is laminated onto the aluminium plate 10*b*. The aluminium side 10*b* of the sheet metal part 10 is welded to the aluminium conductor 12 by way of an interposed layer of copper gauze 13. In hot-press welding used for this purpose, the copper gauze 13 serves to tear open the oxide skin on the aluminium surfaces to be welded to one another. In the region of the sheet metal part 10 which is not welded to the aluminium conductor 12, an aperture 14 is provided which has

an edge 15 which surrounds a copper braid 16 when one end of the copper braid 16 is inserted into the aperture 14. The other end of the copper braid 16 is secured to the carbon brush 11. The one end of the copper braid 16 inserted through the aperture 14 is soft soldered at 17 to the copper layer 10*a* of the sheet metal part. As the copper braid is soft-soldered to copper no local cell is set up at the soldered joint 17 as would have happened if the copper braid had been soldered to aluminium.

The sheet metal part 20 illustrated in Fig. 2 is made from copper. The bottom region of the sheet metal part 20 is provided with openings 21 and the sheet metal part 20 is connected to the aluminium conductor 12*a* by hot-press welding. As shown in Fig. 3, projecting burrs 22 around the openings 21 are directed towards the aluminium conductor 12*a* and penetrate into the aluminium during the welding operation. The softer aluminium of the conductor 12*a* penetrates into the openings 21 in the sheet metal part 20, thus destroying the oxide layer on the surface of the aluminium conductor 12*a* and providing a durable welded joint between the two parts. In the same manner as in the embodiment illustrated in Fig. 1, the carbon brush 11*a* is connected by soldering a copper braid 16*a* to an edge 24 defined by an aperture of the sheet metal part 20 by soft solder 23.

According to Fig. 4, a copper braid 32 is welded at a point 31 transversely across a bottom portion of a bent sheet metal part 30 made of copper. The portions of the copper braid 32 which project at either side of the sheet metal part 30 are connected to an aluminium conductor 12*b* at points 33 by hot-press welding. In this embodiment, the copper braid 32 at the same time serves as a connection lead for the carbon brush 11*b*. The top region of the sheet metal part 30 is provided with a collar 34 into which a fresh copper braid may be inserted when renewing the carbon brush. The braid 32 with the worn out carbon brush 11*b* will then be severed adjacent the welded joint 33.

In the embodiment illustrated in Fig. 5, the sheet metal part is a cable shoe 40 of tinned brass sheet welded to a copper braid 32*a* at a point 49, one end of said copper braid having a carbon brush 11*c* attached thereto. The bottom region of the sheet metal part is cut into a plurality of tongues 41 offset laterally relative to one another. The sheet metal part is mounted as a rider on an aluminium conductor 12*c* and is clamped thereto by the tongues 41 which are slipped onto the conductor 12*c*. The cable shoe 40 is connected to the aluminium conductor 12*c* by the end 42 of the copper braid 32*a* being welded to the conductor 12*c* at a point 48.

In this case also, the copper braid joined to the brush 11*c* is severed above the cable shoe 40 when interchanging the carbon brush, and a fresh copper braid 44 with a fresh carbon brush 45 is inserted into an aperture 46 in the cable shoe 40 and soft soldered to said cable shoe 40 in the region of the collar 47. When the carbon brushes are subsequently interchanged again, the soldered joint is heated, the braid is removed together with the defective carbon brush, and a fresh copper braid is inserted and again soldered to the collar 47 of the cable shoe 40.

This procedure is also adopted for the embodiments illustrated in Figs. 1 to 3.

WHAT WE CLAIM IS:—

1. A connection connecting an electrical aluminium conductor to a copper braid constituting an electrical copper conductor, said connection comprising a sheet metal part welded or clamped to said aluminium conductor and soft-soldered to said copper braid or clamped to said aluminium conductor and welded to said copper braid so that the formation of a local cell between said aluminium and copper conductors is prevented, and wherein a region of said sheet metal part remote from the end thereof welded or clamped to said aluminium conductor is provided with an aperture.

2. A connection as claimed in claim 1, wherein the aperture receives said copper braid.

3. A connection as claimed in claim 1 or 2 wherein one face of said sheet metal part is aluminium and the other face is copper.

4. A connection as claimed in claim 3, wherein said sheet metal part is laminated and has a copper plate affixed to an aluminium plate.

5. A connection as claimed in claim 3 or 4 wherein the aluminium face of the sheet metal part is welded to said aluminium conductor with a metal gauze interpositioned therebetween.

6. A connection as claimed in any of the claims 3 to 5, wherein said copper braid is soft-soldered to the copper face of the sheet metal part.

7. A connection as claimed in claim 1, wherein said sheet metal part is made from copper, is provided with openings, and is connected to said aluminium conductor by hotpress welding.

8. A connection as claimed in claim 1, wherein the sheet metal part has the form of a cable shoe to which is secured said copper braid.

9. A connection as claimed in claim 1, wherein one end of the sheet metal part is

provided with a plurality of tongues, said sheet metal part being mounted as a rider onto said aluminium conductor and clamped thereto by the tongues.

10. A connection as claimed in any preceding claim, wherein said copper braid is attached to said sheet metal part and serves as a connection lead for an electrical component.

11. A connection as claimed in any of claims 1 to 9 wherein said copper braid is attached to said sheet metal part and serves as a connection lead for a carbon brush.

12. A connection connecting an electrical aluminium conductor and a copper braid constituting an electrical copper conductor constructed substantially as hereinbefore described with reference to and as illustrated in Fig. 1 of the accompanying drawings.

13. A connection connecting an electrical aluminium conductor and a copper braid constituting an electrical copper conductor constructed substantially as hereinbefore described with reference to and as illustrated in Figs. 2 and 3 of the accompanying drawings.

14. A connection connecting an electrical aluminium conductor and a copper braid constituting an electrical copper conductor constructed substantially as hereinbefore described with reference to and as illustrated in Fig. 4 of the accompanying drawings.

15. A connection connecting an electrical aluminium conductor and a copper braid constituting an electrical copper conductor constructed substantially as hereinbefore described with reference to and as illustrated in Fig. 5 of the accompanying drawings.

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Fig. 1

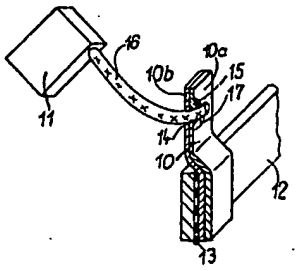

Fig. 2

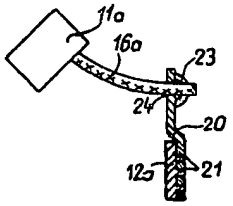

Fig. 3

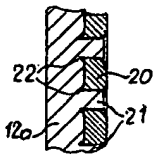

Fig. 4

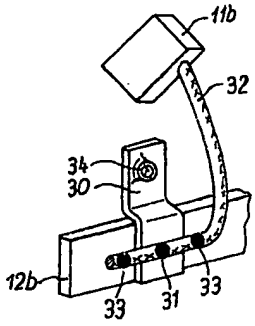

Fig. 5